

Build a LAB — and improve your AM radio reception tonight!

by Larry Ball

Introduction

One of the unwritten laws of life seems to be that the best radio stations are either too far away, or suffer from poor reception for a variety of other reasons. I'm sure you've found weak stations you'd like to receive more clearly. Maybe you've even wondered what stations are out of reach on your AM dial.

In one evening, you can build this AM-tuned coil loop antenna booster (which we'll refer to as the LAB), and hear stations you never knew existed.

The LAB is sure to be the most convenient and durable antenna booster you've ever used.

Unlike most AM-tuned coil loop antenna boosters, the LAB is tunable across the entire AM range and beyond (from 460 KHz to 1800 KHz). By holding the LAB near your radio and tuning both of them to a weak station, you'll hear a dramatic improvement in reception. Weak stations will become strong stations, and new stations will appear as if by magic!

Also, since the LAB is highly directional, it can block out stronger stations which interfere with weaker stations, and it doesn't need batteries or an AC outlet to perform this magic.

Circuit Description

No doubt, you're wondering "What is this LAB?" As shown in Figure 1, the LAB is simply a coil of wire, a variable capacitor, and a DPDT switch. Fifty-nine feet of 22 AWG hook-up wire, a 10 pF to 532 pF variable capacitor, and a DPDT switch combine to form a small tunable loop antenna. The switch allows several of the coils to be removed from

the circuit, so the LAB can cover the entire AM frequency spectrum.

By holding the LAB near the ferrite rod in an AM radio, the signal developed in the LAB will be coupled to the radio to provide an amazing improvement in reception.

Construction

Assembling the LAB is simple, but for durability, neatness is important. The author's prototype was built in a 4-1/2" by 2-1/2" by 1-1/4" plastic project box, which was both compact, yet large enough to comfortably solder all the connections. The placement of holes in the box is shown in Figure 2.

Since you may use whatever parts you have on hand, no measurements are shown for the project box's face. The holes in the ends of the project box (for the wires to enter and exit) should be 3/8" in diameter to accommodate both the wires and the spiral cable wrap.

Also, be careful that the three holes for C1 are drilled accurately in relation to each other. After cutting the holes in the project box, mount S1 and C1 in the box.

Coil Assembly

There are several ways to assemble the coil, but the follow-

ing one seems to be the easiest.

If the terminals of the switch you use aren't marked like the switch in Figure 3, go ahead and mark them. This will greatly simplify construction. Cut two pieces of wire, one 34' long, and one 29'. The extra length gives some leeway when winding the coil. You'll need a temporary form to wind your coil. Use a heavy board, such as a two-by-four; hammer two large headless nails exactly 31-1/2" apart, as shown in Figure 4. These nails should protrude from the board about 1".

Place the project box in the center of the board, with the open cavity facing you. Solder one end of the 34' wire to terminals 1 and 5 of S1. Thread the wire through the 3/8" hole on the left side of the box, around the nail on your left, and around the nail on your right. Then, thread the wire back into the box through the 3/8" hole on its right side.

Repeat this process as neatly as possible, until you've made six moderately tight loops. Temporarily solder the end of the 34' wire to terminal 4 of S1.

Although Figure 1 shows this wire connected directly to C1, do not make the connection yet. The capacitor lead is too fragile to survive the tugging it will be subjected to while winding the coils.

With the 29' piece of wire, begin at terminal 3 and repeat the loop making process as before, but this time make five loops. End the last loop at terminal 6. Cut a piece of spiral cable wrap 80" long, and tightly wrap several inches of it around the coil, on the left side of the

box. Slide the spiral cable wrap through the hole and about 5/8" into the project box.

Tightly wrap the spiral cable wrap around the wire until you reach the nail on the left. Slip the coil off the temporary form and continue tightly wrapping the wire until you reach the right side of the project box. Cut the spiral cable wrap long enough so that you can insert about 5/8" of it into the side of the box.

The Capacitor

The coils are now ready to connect to C1. To identify the leads on C1, begin by looking at the back of the capacitor. All six of the leads on the back edge of the capacitor are trimmer connections, and we're not concerned with them.

On the front edge of the capacitor, there are two leads on one side and a single lead on another side. The single lead is the common lead of two 266 pF variable capacitors, and we will use this as one of our leads.

The two leads on the other side are the other external connections of the two 266 pF capacitors. We'll solder these two leads together to make a single 532 pF capacitor. This will be our other capacitor lead.

It's now time to de-solder the wire which was temporarily connected to terminal 4 of S1, and connect it to C1.

Finally, connect terminal 2 of S1 to the remaining lead of C1 to complete the coil assembly.

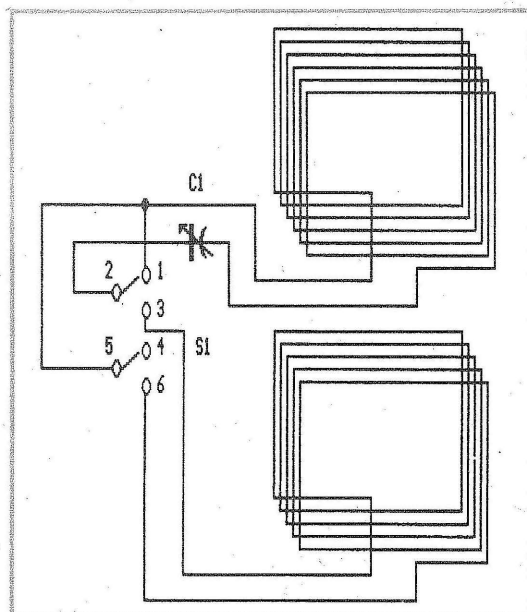
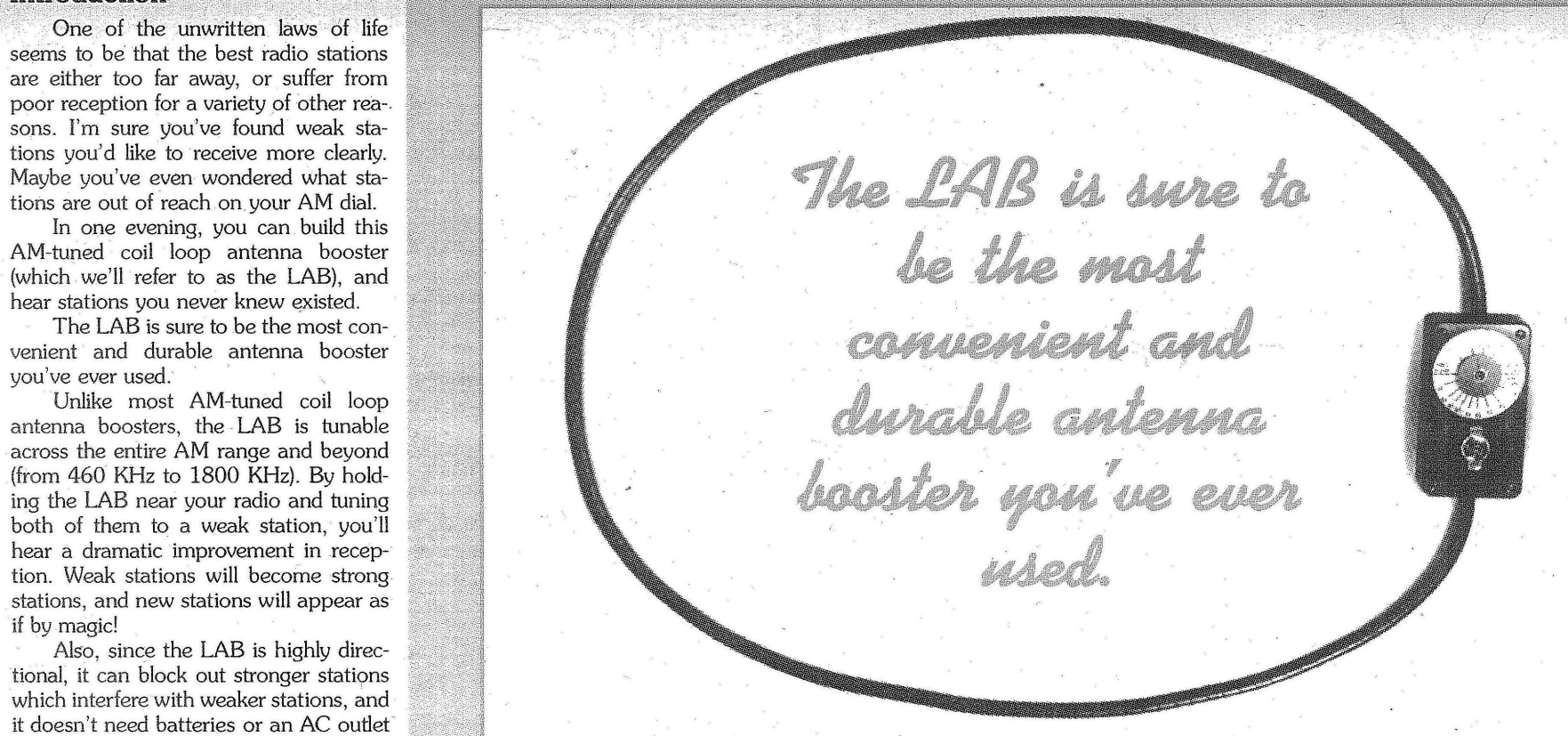


Figure 1. With this simple circuit, you can receive AM radio stations you never knew existed.

Improve your AM radio reception tonight!

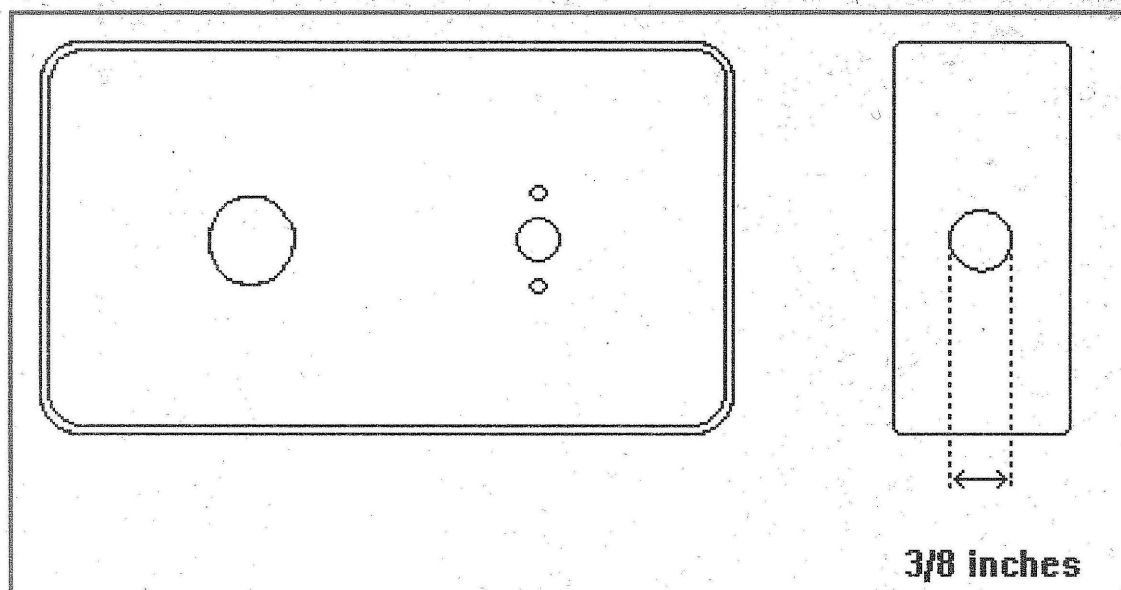


Figure 2. The project box holes should be evenly spaced, and the end holes need to be big enough for both the wires and the spiral cable wrap.

Dial and Dial Plate

Trace or photocopy Figure 5 to make a dial plate, then attach it to the LAB for convenient tuning.

To make the frequency adjustment knob for C1, use a thin, easily cut plastic, such as a cap from a 35 mm film

canister. Cut out a 1" diameter disc, make a 1/8" hole in its center, then draw a line to bisect the disc. Turn C1 fully clockwise, then attach the disc with its bisecting line parallel to the line which separates the high range and low range of the LAB.

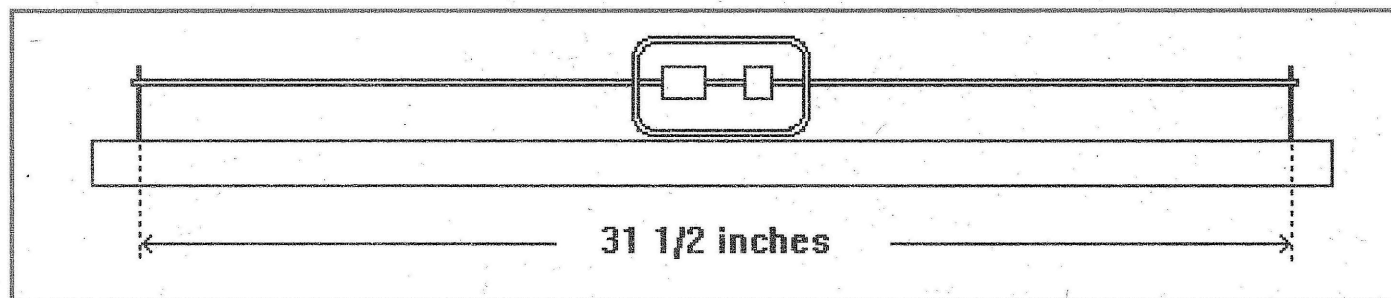


Figure 4. A two-by-four with two headless nails will save you from struggling with a bird's nest of wires.

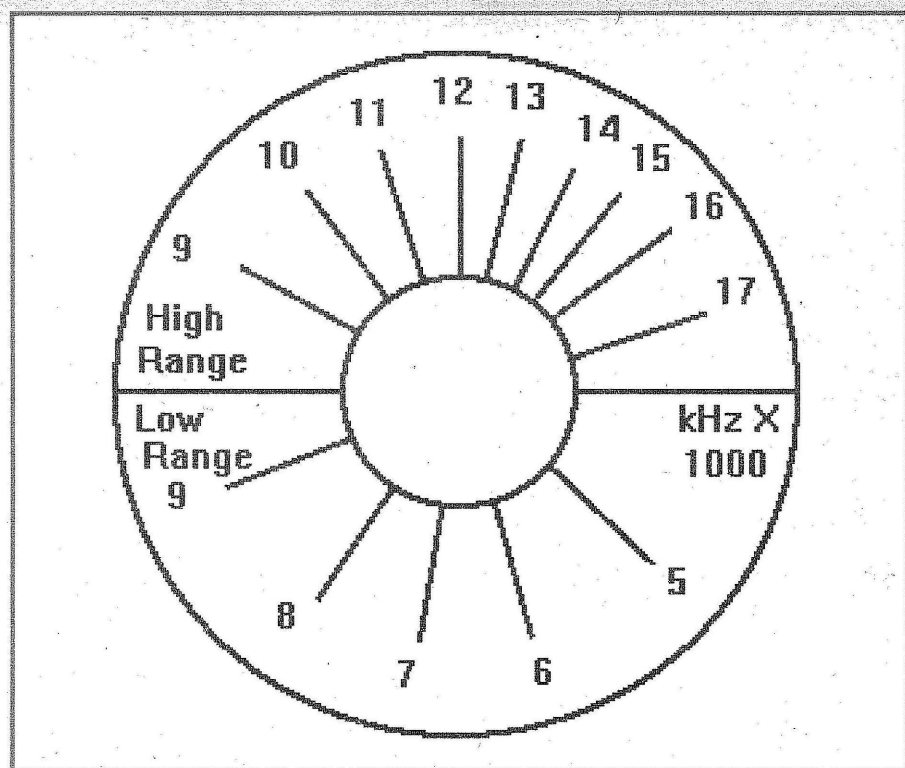
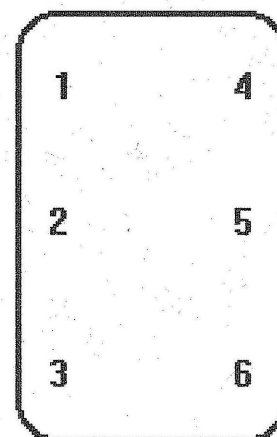


Figure 5. Trace or photocopy this dial plate, and glue it to the LAB for convenient tuning.

DPDT switch



back view

Figure 3. Marking your DPDT switch like this will simplify construction of the LAB.

The disc needs to be attached with a small washer on BOTH sides, and the center screw must be tightened enough

to keep the disc from slipping.

Operation

Assuming the coils were properly connected to C1 and S1, the LAB should work the first time it's tried. If it doesn't, check all of the connections you can see in the project box. A sensitive VOM can differentiate between the six loop coil and the five loop coil.

Unfortunately, it can't tell you if one coil is wound opposite the other. If the LAB will only tune to its highest frequencies, and you suspect you've made this mistake, swap the connections on terminals 3 and 6 of S1.

To use the LAB, tune an AM radio to a weak station you'd like to receive more clearly. Place the LAB against the case of the radio and use S1 to select the proper frequency range. Turn the dial on the LAB until you hear a difference in reception.

At this point, both the radio and the LAB are tuned to the same frequency. Experiment with the position of the LAB, while fine-tuning C1 to insure the best possible reception. The poorer the reception is initially, the more improvement can be expected.

Stations with good reception will improve little, but weak stations, and stations experiencing interference from stronger (or closer) stations, will improve dramatically.

Once you've built the LAB, you'll see that it's an idea ripe for experimentation. Try building LABs with larger coils, smaller coils, or simpler designs for a narrower band of frequencies, maybe even a single frequency. NV

PARTS LIST FOR LOOP ANTENNA BOOSTER (LAB)

CAPACITOR

C1 - 5 pF to 266 pF AM tuner capacitor (two sections).

ADDITIONAL PARTS AND MATERIALS

S1 - DPDT switch.

MISCELLANEOUS: 63' of 22 AWG stranded hook-up wire, project enclosure, spiral cable wrap, printed dial plate, 35 mm film canister cap (to make dial), mounting screws for capacitor (M2.5x0.45x4mm) (two), shaft screw for capacitor (M2.6x0.45x4mm), solder, hardware, etc.

Note:

The following parts are available from **Mouser Electronics**, 2401 Hwy. 287 N., Mansfield, TX 76063-4827, **1-800-346-6873**:

5 pF to 266 pF AM tuner capacitor (two sections), part #24TR218; capacitor mounting screws part #48SS003; shaft screw for capacitor part #48SM026. Cost is \$2.98, \$.04, \$.04, respectively plus \$2.00 shipping, a total of \$5.06.

The 5 pF to 266 pF AM tuner capacitor (two sections) part #24TR218 is also available from **DC Electronics**, P.O. Box 3203, Scottsdale, AZ 85257-3293, **1-800-467-7736**. Cost is \$2.71 plus \$4.00 shipping, a total of \$6.71.

The LAB is also available as a complete kit from **Futuretech**, P.O. Box 6291, Gulf Breeze, FL 32561, **850-932-9682**. Cost is \$19.95 plus \$3.00 for shipping, Florida residents add 7% sales tax.